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<110> Sung, Wing

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<130> 07121.0003U1

<140> 09/990,874
<141> 2001-11-21

<160> 71

<170> PatentIn version 3.0

<210> 1

<211> 184

<212> PRT

<213> Aspergillus niger

<400> 1

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Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gly Asn Leu Gly Asp
1               5                  10                  15

Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
            20                  25                  30

Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Trp Thr Thr Gly Ser
        35                  40                  45

Ser Asn Ala Ile Thr Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser Ser
    50                  55                  60

Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gly Ala Glu Tyr
65                  70                  75                  80

Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala Thr
                85                  90                  95

Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys Thr
            100                 105                 110

Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe Thr
        115                 120                 125

Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val Thr
    130                 135                 140

Val Ala Asn His Phe Asn Phe Trp Ala Gln His Gly Phe Gly Asn Ser
145                 150                 155                 160

Asp Phe Asn Tyr Gln Val Met Ala Val Glu Ala Trp Ser Gly Ala Gly
                165                 170                 175
```

Ser Ala Ser Val Thr Ile Ser Ser
180

<210> 2

<211> 185

<212> PRT

<213> Aspergillus tubigensis

<400> 2

Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gln Asn Leu Gly Asp
1 5 10 15

Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
20 25 30

Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Gly Trp Thr Thr Gly
35 40 45

Ser Ser Asn Ala Ile Thr Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser
50 55 60

Ala Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gln Ala Glu
65 70 75 80

Tyr Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala
85 90 95

Thr Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys
100 105 110

Thr Asp Thr Arg Ile Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe
115 120 125

Thr Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val
130 135 140

Thr Val Ala Asn His Phe Asn Phe Trp Ala His His Gly Phe His Asn
145 150 155 160

Ser Asp Phe Asn Tyr Gln Val Val Ala Val Glu Ala Trp Ser Gly Ala
165 170 175

Gly Ser Ala Ala Val Thr Ile Ser Ser
180 185

<210> 3

<211> 185

<212> PRT

<213> Bacillus circulans

<400> 3

```
Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
1               5                  10                  15

Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
            20                  25                  30

Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
        35                  40                  45

Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
    50                  55                  60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
65                  70                  75                  80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
                85                  90                  95

Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
            100                 105                 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
        115                 120                 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
    130                 135                 140

Thr Phe Thr Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
145                 150                 155                 160

Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
                165                 170                 175

Ser Gly Ser Ser Asn Val Thr Val Trp
            180                 185
```

<210> 4

<211> 201

<212> PRT

<213> Bacillus pumilus

<400> 4

```
Arg Thr Ile Thr Asn Asn Glu Met Gly Asn His Ser Gly Tyr Asp Tyr
1               5                  10                  15

Glu Leu Trp Lys Asp Tyr Gly Asn Thr Ser Met Thr Leu Asn Asn Gly
            20                  25                  30

Gly Ala Phe Ser Ala Gly Trp Asn Asn Ile Gly Asn Ala Leu Phe Arg
        35                  40                  45
```

```
Lys Gly Lys Lys Phe Asp Ser Thr Arg Thr His His Gln Leu Gly Asn
    50                  55                  60

Ile Ser Ile Asn Tyr Asn Ala Ser Phe Asn Pro Ser Gly Asn Ser Tyr
65                  70                  75                  80

Leu Cys Val Tyr Gly Trp Thr Gln Ser Pro Leu Ala Glu Tyr Tyr Ile
                85                  90                  95

Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Ala Tyr Lys Gly Ser
            100                 105                 110

Phe Tyr Ala Asp Gly Gly Thr Tyr Asp Ile Tyr Glu Thr Thr Arg Val
        115                 120                 125

Asn Gln Pro Ser Ile Ile Gly Ile Ala Thr Phe Lys Gln Tyr Trp Ser
    130                 135                 140

Val Arg Gln Thr Lys Arg Thr Ser Gly Thr Val Ser Val Ser Ala His
145                 150                 155                 160

Phe Arg Lys Trp Glu Ser Leu Gly Met Pro Met Gly Lys Met Tyr Glu
                165                 170                 175

Thr Ala Phe Thr Val Glu Gly Tyr Gln Ser Ser Gly Ser Ala Asn Val
            180                 185                 190

Met Thr Asn Gln Leu Phe Ile Gly Asn
        195                 200
```

<210> 5

<211> 185

<212> PRT

<213> Bacillus subtilus

<400> 5

```
Ala Ser Thr Asp Tyr Trp Gln Asn Trp Thr Asp Gly Gly Gly Ile Val
1               5                   10                  15

Asn Ala Val Asn Gly Ser Gly Gly Asn Tyr Ser Val Asn Trp Ser Asn
            20                  25                  30

Thr Gly Asn Phe Val Val Gly Lys Gly Trp Thr Thr Gly Ser Pro Phe
        35                  40                  45

Arg Thr Ile Asn Tyr Asn Ala Gly Val Trp Ala Pro Asn Gly Asn Gly
    50                  55                  60

Tyr Leu Thr Leu Tyr Gly Trp Thr Arg Ser Pro Leu Ile Glu Tyr Tyr
65                  70                  75                  80

Val Val Asp Ser Trp Gly Thr Tyr Arg Pro Thr Gly Thr Tyr Lys Gly
                85                  90                  95
```

```
Thr Val Lys Ser Asp Gly Gly Thr Tyr Asp Ile Tyr Thr Thr Thr Arg
            100                 105                 110

Tyr Asn Ala Pro Ser Ile Asp Gly Asp Arg Thr Thr Phe Thr Gln Tyr
        115                 120                 125

Trp Ser Val Arg Gln Ser Lys Arg Pro Thr Gly Ser Asn Ala Thr Ile
    130                 135                 140

Thr Phe Ser Asn His Val Asn Ala Trp Lys Ser His Gly Met Asn Leu
145                 150                 155                 160

Gly Ser Asn Trp Ala Tyr Gln Val Met Ala Thr Glu Gly Tyr Gln Ser
                165                 170                 175

Ser Gly Ser Ser Asn Val Thr Val Trp
            180                 185
```

<210> 6

<211> 211

<212> PRT

<213> Clostridium acetobutylicum

<400> 6

```
Ser Ala Phe Asn Thr Gln Ala Ala Pro Lys Thr Ile Thr Ser Asn Glu
1               5                   10                  15

Ile Gly Val Asn Gly Gly Tyr Asp Tyr Glu Leu Trp Lys Asp Tyr Gly
            20                  25                  30

Asn Thr Ser Met Thr Leu Lys Asn Gly Gly Ala Phe Ser Cys Gln Trp
        35                  40                  45

Ser Asn Ile Gly Asn Ala Leu Phe Arg Lys Gly Lys Lys Phe Asn Asp
    50                  55                  60

Thr Gln Thr Tyr Lys Gln Leu Gly Asn Ile Ser Val Asn Tyr Asn Cys
65                  70                  75                  80

Asn Tyr Gln Pro Tyr Gly Asn Ser Tyr Leu Cys Val Tyr Gly Trp Thr
                85                  90                  95

Ser Ser Pro Leu Val Glu Tyr Tyr Ile Val Asp Ser Trp Gly Ser Trp
            100                 105                 110

Arg Pro Pro Gly Gly Thr Ser Lys Gly Thr Ile Thr Val Asp Gly Gly
        115                 120                 125

Ile Tyr Asp Ile Tyr Glu Thr Thr Arg Ile Asn Gln Pro Ser Ile Gln
    130                 135                 140

Gly Asn Thr Thr Phe Lys Gln Tyr Trp Ser Val Arg Arg Thr Lys Arg
145                 150                 155                 160
```

```
Thr Ser Gly Thr Ile Ser Val Ser Lys His Phe Ala Ala Trp Glu Ser
                165                 170                 175

Lys Gly Met Pro Leu Gly Lys Met His Glu Thr Ala Phe Asn Ile Glu
            180                 185                 190

Gly Tyr Gln Ser Ser Gly Lys Ala Asp Val Asn Ser Met Ser Ile Asn
        195                 200                 205

Ile Gly Lys
    210
```

<210> 7

<211> 206

<212> PRT

<213> Clostridium stercocrarium

<400> 7

```
Gly Arg Ile Ile Tyr Asp Asn Glu Thr Gly Thr His Gly Gly Tyr Asp
1               5                   10                  15

Tyr Glu Leu Trp Lys Asp Tyr Gly Asn Thr Ile Met Glu Leu Asn Asp
            20                  25                  30

Gly Gly Thr Phe Ser Cys Gln Trp Ser Asn Ile Gly Asn Ala Leu Phe
        35                  40                  45

Arg Lys Gly Arg Lys Phe Asn Ser Asp Lys Thr Tyr Gln Glu Leu Gly
    50                  55                  60

Asp Ile Val Val Glu Tyr Gly Cys Asp Tyr Asn Pro Asn Gly Asn Ser
65                  70                  75                  80

Tyr Leu Cys Val Tyr Gly Trp Thr Arg Asn Phe Leu Val Glu Tyr Tyr
                85                  90                  95

Ile Val Glu Ser Trp Gly Ser Trp Arg Pro Pro Gly Ala Thr Pro Lys
            100                 105                 110

Gly Thr Ile Thr Gln Trp Met Ala Gly Thr Tyr Glu Ile Tyr Glu Thr
        115                 120                 125

Thr Arg Val Asn Gln Pro Ser Ile Asp Gly Thr Ala Thr Phe Gln Gln
    130                 135                 140

Tyr Trp Ser Val Arg Thr Ser Lys Arg Thr Ser Gly Thr Ile Ser Val
145                 150                 155                 160

Thr Glu His Phe Lys Gln Trp Glu Arg Met Gly Met Arg Met Gly Lys
                165                 170                 175

Met Tyr Glu Val Ala Leu Thr Val Glu Gly Tyr Gln Ser Ser Gly Tyr
            180                 185                 190
```

Ala Asn Val Tyr Lys Asn Glu Ile Arg Ile Gly Ala Asn Pro
195 200 205

<210> 8

<211> 211

<212> PRT

<213> Ruminoccus flavefaciens

<400> 8

Ser Ala Ala Asp Gln Gln Thr Arg Gly Asn Val Gly Gly Tyr Asp Tyr
1 5 10 15

Glu Met Trp Asn Gln Asn Gly Gln Gly Gln Ala Ser Met Asn Pro Gly
20 25 30

Ala Gly Ser Phe Thr Cys Ser Trp Ser Asn Ile Glu Asn Phe Leu Ala
35 40 45

Arg Met Gly Lys Asn Tyr Asp Ser Gln Lys Lys Asn Tyr Lys Ala Phe
50 55 60

Gly Asn Ile Val Leu Thr Tyr Asp Val Glu Tyr Thr Pro Arg Gly Asn
65 70 75 80

Ser Tyr Met Cys Val Tyr Gly Trp Thr Arg Asn Pro Leu Met Glu Tyr
85 90 95

Tyr Ile Val Glu Gly Trp Gly Asp Trp Arg Pro Pro Gly Asn Asp Gly
100 105 110

Glu Val Lys Gly Thr Val Ser Ala Asn Gly Asn Thr Tyr Asp Ile Arg
115 120 125

Lys Thr Met Arg Tyr Asn Gln Pro Ser Leu Asp Gly Thr Ala Thr Phe
130 135 140

Pro Gln Tyr Trp Ser Val Arg Gln Thr Ser Gly Ser Ala Asn Asn Gln
145 150 155 160

Thr Asn Tyr Met Lys Gly Thr Ile Asp Val Ser Lys His Phe Asp Ala
165 170 175

Trp Ser Ala Ala Gly Leu Asp Met Ser Gly Thr Leu Tyr Glu Val Ser
180 185 190

Leu Asn Ile Glu Gly Tyr Arg Ser Asn Gly Ser Ala Asn Val Lys Ser
195 200 205

Val Ser Val
210

<210> 9

<211> 197

<212> PRT

<213> Schizophyllum cimmune

<400> 9

```
Ser Gly Thr Pro Ser Ser Thr Gly Thr Asp Gly Gly Tyr Tyr Tyr Ser
1               5                  10                  15

Trp Trp Thr Asp Gly Ala Gly Asp Ala Thr Tyr Gln Asn Asn Gly Gly
            20                  25                  30

Gly Ser Tyr Thr Leu Thr Trp Ser Gly Asn Asn Gly Asn Leu Val Gly
        35                  40                  45

Gly Lys Gly Trp Asn Pro Gly Ala Ala Ser Arg Ser Ile Ser Tyr Ser
    50                  55                  60

Gly Thr Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp
65                  70                  75                  80

Thr Arg Ser Ser Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Ser
                85                  90                  95

Tyr Asp Pro Ser Ser Ala Ala Ser His Lys Gly Ser Val Thr Cys Asn
            100                 105                 110

Gly Ala Thr Tyr Asp Ile Leu Ser Thr Trp Arg Tyr Asn Ala Pro Ser
        115                 120                 125

Ile Asp Gly Thr Gln Thr Phe Glu Gln Phe Trp Ser Val Arg Asn Pro
    130                 135                 140

Lys Lys Ala Pro Gly Gly Ser Ile Ser Gly Thr Val Asp Val Gln Cys
145                 150                 155                 160

His Phe Asp Ala Trp Lys Gly Leu Gly Met Asn Leu Gly Ser Glu His
                165                 170                 175

Asn Tyr Gln Ile Val Ala Thr Glu Gly Tyr Gln Ser Ser Gly Thr Ala
            180                 185                 190

Thr Ile Thr Val Thr
        195
```

<210> 10

<211> 191

<212> PRT

<213> Streptomyces lividans Xyl B

<400> 10

```
Asp Thr Val Val Thr Thr Asn Gln Glu Gly Thr Asn Asn Gly Tyr Tyr
1               5                  10                  15

Tyr Ser Phe Trp Thr Asp Ser Gln Gly Thr Val Ser Met Asn Met Gly
            20                  25                  30

Ser Gly Gly Gln Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val
        35                  40                  45

Ala Gly Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Gln Tyr Ser
    50                  55                  60

Gly Ser Phe Asn Pro Ser Gly Asn Ala Tyr Leu Ala Leu Tyr Gly Trp
65                  70                  75                  80

Thr Ser Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Thr
                85                  90                  95

Tyr Arg Pro Thr Gly Glu Tyr Lys Gly Thr Val Thr Ser Asp Gly Gly
            100                 105                 110

Thr Tyr Asp Ile Tyr Lys Thr Thr Arg Val Asn Lys Pro Ser Val Glu
        115                 120                 125

Gly Thr Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg
    130                 135                 140

Thr Gly Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
145                 150                 155                 160

Ala Gly Met Pro Leu Gly Asn Phe Ser Tyr Tyr Met Ile Asn Ala Thr
                165                 170                 175

Glu Gly Tyr Gln Ser Ser Gly Thr Ser Ser Ile Asn Val Gly Gly
            180                 185                 190
```

<210> 11

<211> 191

<212> PRT

<213> Streptomyces lividans Xyl C

<400> 11

```
Ala Thr Thr Ile Thr Thr Asn Gln Thr Gly Thr Asp Gly Met Tyr Tyr
1               5                  10                  15

Ser Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly
            20                  25                  30

Gly Gly Ser Tyr Ser Thr Gln Trp Thr Asn Cys Gly Asn Phe Val Ala
        35                  40                  45
```

```
Gly Lys Gly Trp Ser Thr Gly Asp Gly Asn Val Arg Tyr Asn Gly Tyr
    50                  55                  60

Phe Asn Pro Val Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
65                  70                  75                  80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
                85                  90                  95

Pro Thr Gly Thr Tyr Lys Gly Thr Val Ser Ser Asp Gly Gly Thr Tyr
            100                 105                 110

Asp Ile Tyr Gln Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Gly Thr
        115                 120                 125

Lys Thr Phe Gln Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
    130                 135                 140

Gly Ser Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg
145                 150                 155                 160

Ala Gly Met Asn Met Gly Gln Phe Arg Tyr Tyr Met Ile Asn Ala Thr
                165                 170                 175

Glu Gly Tyr Gln Ser Ser Gly Ser Ser Asn Ile Thr Val Ser Gly
            180                 185                 190
```

<210> 12

<211> 189

<212> PRT

<213> Streptomyces sp. No. 36a

<400> 12

```
Ala Thr Thr Ile Thr Asn Glu Thr Gly Tyr Asp Gly Met Tyr Tyr Ser
1               5                   10                  15

Phe Trp Thr Asp Gly Gly Gly Ser Val Ser Met Thr Leu Asn Gly Gly
            20                  25                  30

Gly Ser Tyr Ser Thr Arg Trp Thr Asn Cys Gly Asn Phe Val Ala Gly
        35                  40                  45

Lys Gly Trp Ala Asn Gly Gly Arg Arg Thr Val Arg Tyr Thr Gly Trp
    50                  55                  60

Phe Asn Pro Ser Gly Asn Gly Tyr Gly Cys Leu Tyr Gly Trp Thr Ser
65                  70                  75                  80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Asp Asn Trp Gly Ser Tyr Arg
                85                  90                  95

Pro Thr Gly Glu Thr Arg Gly Thr Val His Ser Asp Gly Gly Thr Tyr
            100                 105                 110
```

```
Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Val Glu Ala Pro
        115                 120                 125

Ala Ala Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Val Thr Ser
    130                 135                 140

Gly Thr Ile Thr Thr Gly Asn His Phe Asp Ala Trp Ala Arg Ala Gly
145                 150                 155                 160

Met Asn Met Gly Asn Phe Arg Tyr Tyr Met Ile Asn Ala Thr Glu Gly
                165                 170                 175

Tyr Gln Ser Ser Gly Ser Ser Thr Ile Thr Val Ser Gly
            180                 185
```

<210> 13

<211> 189

<212> PRT

<213> Thermomonospora fusca

<400> 13

```
Ala Val Thr Ser Asn Glu Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser
1               5                   10                  15

Phe Trp Thr Asp Ala Pro Gly Thr Val Ser Met Glu Leu Gly Pro Gly
            20                  25                  30

Gly Asn Tyr Ser Thr Ser Trp Arg Asn Thr Gly Asn Phe Val Ala Gly
        35                  40                  45

Lys Gly Trp Ala Thr Gly Gly Arg Arg Thr Val Thr Tyr Ser Ala Ser
    50                  55                  60

Phe Asn Pro Ser Gly Asn Ala Tyr Leu Thr Leu Tyr Gly Trp Thr Arg
65                  70                  75                  80

Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Ser Trp Gly Thr Tyr Arg
                85                  90                  95

Pro Thr Gly Thr Tyr Met Gly Thr Val Thr Thr Asp Gly Gly Thr Tyr
            100                 105                 110

Asp Ile Tyr Lys Thr Thr Arg Tyr Asn Ala Pro Ser Ile Glu Gly Thr
        115                 120                 125

Arg Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Ser Lys Arg Thr Ser
    130                 135                 140

Gly Thr Ile Thr Ala Gly Asn His Phe Asp Ala Trp Ala Arg His Gly
145                 150                 155                 160

Met His Leu Gly Thr His Asp Tyr Met Ile Met Ala Thr Glu Gly Tyr
                165                 170                 175
```

Gln Ser Ser Gly Ser Ser Asn Val Thr Leu Gly Thr Ser
180 185

<210> 14

<211> 190

<212> PRT

<213> Trichoderma harzanium

<400> 14

Gln Thr Ile Gly Pro Gly Thr Gly Tyr Ser Asn Gly Tyr Tyr Tyr Ser
1 5 10 15

Tyr Trp Asn Asp Gly His Ala Gly Val Thr Tyr Thr Asn Gly Gly Gly
20 25 30

Gly Ser Phe Thr Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Ile Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
115 120 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

Ser His Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
180 185 190

<210> 15

<211> 178

<212> PRT

<213> Trichoderma ressei Xyl I

<400> 15

```
Ala Ser Ile Asn Tyr Asp Gln Asn Tyr Gln Thr Gly Gly Gln Val Ser
1               5                  10                  15

Tyr Ser Pro Ser Asn Thr Gly Phe Ser Val Asn Trp Asn Thr Gln Asp
            20                  25                  30

Asp Phe Val Val Gly Val Gly Trp Thr Thr Gly Ser Ser Ala Pro Ile
        35                  40                  45

Asn Phe Gly Gly Ser Phe Ser Val Asn Ser Gly Thr Gly Leu Leu Ser
    50                  55                  60

Val Tyr Gly Trp Ser Thr Asn Pro Leu Val Glu Tyr Tyr Ile Met Glu
65                  70                  75                  80

Asp Asn His Asn Tyr Pro Ala Gln Gly Thr Val Lys Gly Thr Val Thr
                85                  90                  95

Ser Asp Gly Ala Thr Tyr Thr Ile Trp Glu Asn Thr Arg Val Asn Glu
            100                 105                 110

Pro Ser Ile Gln Gly Thr Ala Thr Phe Asn Gln Tyr Ile Ser Val Arg
        115                 120                 125

Asn Ser Pro Arg Thr Ser Gly Thr Val Thr Val Gln Asn His Phe Asn
    130                 135                 140

Trp Ala Ser Leu Gly Leu His Leu Gly Gln Met Met Asn Tyr Gln Val
145                 150                 155                 160

Val Ala Val Glu Gly Trp Gly Gly Ser Gly Ser Ala Ser Gln Ser Val
                165                 170                 175

Ser Asn
```

<210> 16

<211> 190

<212> PRT

<213> Trichoderma ressei Xyl II

<400> 16

```
Gln Thr Ile Gln Pro Gly Thr Gly Tyr Asn Asn Gly Tyr Phe Tyr Ser
1               5                  10                  15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Tyr Thr Asn Gly Pro Gly
            20                  25                  30

Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
        35                  40                  45
```

```
Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
    50                  55                  60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
65                  70                  75                  80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
                85                  90                  95

Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
            100                 105                 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
        115                 120                 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn His
    130                 135                 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145                 150                 155                 160

Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val

                165                 170                 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
            180                 185                 190
```

<210> 17

<211> 190

<212> PRT

<213> Trichoderma viride

<400> 17

```
Gln Thr Ile Gln Pro Gly Thr Gly Phe Asn Asn Gly Tyr Phe Tyr Ser
1               5                   10                  15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Tyr Thr Asn Gly Pro Gly
            20                  25                  30

Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
        35                  40                  45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
    50                  55                  60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ser Val Tyr Gly Trp Ser
65                  70                  75                  80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
                85                  90                  95
```

```
Asn Pro Ser Thr Gly Ala Thr Lys Leu Gly Glu Val Thr Ser Asp Gly
            100                 105                 110

Ser Val Tyr Asp Ile Tyr Arg Thr Gln Arg Val Asn Gln Pro Ser Ile
        115                 120                 125

Ile Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Thr His
    130                 135                 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145                 150                 155                 160

Gln Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
                165                 170                 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
            180                 185                 190
```

<210> 18

<211> 202

<212> PRT

<213> Fibrobacter succinognees

<400> 18

```
Asn Ser Ser Val Thr Gly Asn Val Gly Ser Ser Pro Tyr His Tyr Glu
1               5                   10                  15

Ile Trp Tyr Gln Gly Gly Asn Asn Ser Met Thr Phe Tyr Asp Asn Gly
            20                  25                  30

Thr Tyr Lys Ala Ser Trp Asn Gly Thr Asn Asp Phe Leu Ala Arg Val
        35                  40                  45

Gly Phe Lys Tyr Asp Glu Lys His Thr Tyr Glu Glu Leu Gly Pro Ile
    50                  55                  60

Asp Ala Tyr Tyr Lys Trp Ser Lys Gln Gly Ser Ala Gly Gly Tyr Asn
65                  70                  75                  80

Tyr Ile Gly Ile Tyr Gly Trp Thr Val Asp Pro Leu Val Glu Tyr Tyr
                85                  90                  95

Ile Val Asp Asp Trp Phe Asn Lys Pro Gly Ala Asn Leu Leu Gly Gln
            100                 105                 110

Arg Lys Gly Glu Phe Thr Val Asp Gly Asp Thr Tyr Glu Ile Trp Gln
        115                 120                 125

Asn Thr Arg Val Gln Gln Pro Ser Ile Lys Gly Thr Gln Thr Phe Pro
    130                 135                 140

Gln Tyr Phe Ser Val Arg Lys Ser Ala Arg Ser Cys Gly His Ile Asp
145                 150                 155                 160
```

```
Ile Thr Ala His Met Lys Lys Trp Glu Glu Leu Gly Met Lys Met Gly
                165                 170                 175

Lys Met Tyr Glu Ala Lys Val Leu Val Glu Ala Gly Gly Gly Ser Gly
            180                 185                 190

Ser Phe Asp Val Thr Tyr Phe Lys Met Thr
        195                 200
```

<210> 19

<211> 189

<212> PRT

<213> Asparigillus awamori var. kawachi

<400> 19

```
Arg Ser Thr Pro Ser Ser Thr Gly Glu Asn Asn Gly Tyr Tyr Tyr Ser
1               5                   10                  15

Phe Trp Thr Asp Gly Gly Gly Asp Val Thr Tyr Thr Asn Gly Asn Ala
            20                  25                  30

Gly Ser Tyr Ser Val Glu Trp Ser Asn Val Gly Asn Phe Val Gly Gly
        35                  40                  45

Lys Gly Trp Asn Pro Gly Ser Ala Lys Asp Ile Thr Tyr Ser Gly Asn
    50                  55                  60

Phe Thr Pro Ser Gly Asn Gly Tyr Leu Ser Val Tyr Gly Trp Thr Thr
65                  70                  75                  80

Asp Pro Leu Ile Glu Tyr Tyr Ile Val Glu Ser Tyr Gly Asp Tyr Asn
                85                  90                  95

Pro Gly Ser Gly Gly Thr Thr Arg Gly Asn Val Ser Ser Asp Gly Ser
            100                 105                 110

Val Tyr Asp Ile Tyr Thr Ala Thr Arg Thr Asn Ala Pro Ser Ile Asp
        115                 120                 125

Gly Thr Gln Thr Phe Ser Gln Tyr Trp Ser Val Arg Gln Asn Lys Arg
    130                 135                 140

Val Gly Gly Thr Val Thr Thr Ser Asn His Phe Asn Ala Trp Ala Lys
145                 150                 155                 160

Leu Gly Met Asn Leu Gly Thr His Asn Tyr Gln Ile Leu Ala Thr Glu
                165                 170                 175

Gly Tyr Gln Ser Ser Gly Ser Ser Ser Ile Thr Ile Gln
            180                 185
```

<210> 20

<211> 194

<212> PRT

<213> Thermomyces lanuginosus

<400> 20

```
Gln Thr Thr Pro Asn Ser Glu Gly Trp His Asp Gly Tyr Tyr Tyr Ser
1               5                  10                  15

Trp Trp Ser Asp Gly Gly Ala Gln Ala Thr Tyr Thr Asn Leu Glu Gly
            20                  25                  30

Gly Thr Tyr Glu Ile Ser Trp Gly Asp Gly Gly Asn Leu Val Gly Gly
        35                  40                  45

Lys Gly Trp Asn Pro Gly Leu Asn Ala Arg Ala Ile His Phe Glu Gly
    50                  55                  60

Val Tyr Gln Pro Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Thr
65                  70                  75                  80

Arg Asn Pro Leu Val Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
                85                  90                  95

Asp Pro Ser Ser Gly Ala Thr Asp Leu Gly Thr Val Glu Cys Asp Gly
            100                 105                 110

Ser Ile Tyr Arg Leu Gly Lys Thr Thr Arg Val Asn Ala Pro Ser Ile
        115                 120                 125

Asp Gly Thr Gln Thr Phe Asp Gln Tyr Trp Ser Val Arg Gln Asp Lys
    130                 135                 140

Arg Thr Ser Gly Thr Val Gln Thr Gly Cys His Phe Asp Ala Trp Ala
145                 150                 155                 160

Arg Ala Gly Leu Asn Val Asn Gly Asp His Tyr Tyr Gln Ile Val Ala
                165                 170                 175

Thr Glu Gly Tyr Phe Ser Ser Gly Tyr Ala Arg Ile Thr Val Ala Asp
            180                 185                 190

Val Gly
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<210> 21

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<223> Trx-1

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cttttacagc tattgg 76

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<211> 78

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<223> XyTv-2

<400> 22
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tggtctaact ccggaaac 78

<210> 23

<211> 78

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<223> Trx-3

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tcttataatc cgaatggg 78

<210> 24

<211> 74

<212> DNA

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<223> XyTv-4

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gaaaatttcg gtac 74

<210> 25

<211> 51

<212> DNA

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<223> Trx-8

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<211> 84

<212> DNA

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<223> XyTv-7

<400> 26
ccaatgaaaa tgtcgataac cttgctaccg gtaccaccac aatggatatg tttgcccggg 60

cctccggtta aatcgcagtt aacc 84

<210> 27

<211> 78

<212> DNA

<213> Artificial Sequence

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<223> Trx-6

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tagttgaaga gacctaga 78

<210> 28

<211> 85

<212> DNA

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<223> XyTv-5

<400> 28
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cttataatgt aacagctttt aaagc 85

<210> 29

<211> 58

<212> DNA

<213> Artificial Sequence

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<223> XyTv-101

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<210> 30

<211> 53

<212> DNA

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<223> XyTv-102

<400> 30
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<210> 31

<211> 59

<212> DNA

<213> Artificial Sequence

<220>

<223> Trx-103

<400> 31
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<210> 32

<211> 69

<212> DNA

<213> Artificial Sequence

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<223> XyTv-104

<400> 32
tccggttcgg ttaatactgc gaatcacttt aatgcatggg cacagcaagg gttaacccta 60

ggtacaatg 69

<210> 33

<211> 67

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<223> XyTv-105

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agctaaa 67

<210> 34

<211> 73

<212> DNA

<213> Artificial Sequence

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<223> XyTv-110

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<210> 35

<211> 54

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<223> XyTv-109

<400> 35
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<210> 36

<211> 60

<212> DNA

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<220>

<223> XyTv-108

<400> 36
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<210> 37

<211> 66

<212> DNA

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<223> XyTv-107

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catcgc 66

<210> 38

<211> 53

<212> DNA

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<220>

<223> XyTv-106

<400> 38
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<211> 596

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ccaatttagc gtcaattggt ctaactccgg aaacttcgta ggtggaaaag gttggcaacc 180

cgggaccaaa aataaggtga tcaacttctc tggatcttat aatccgaatg ggaattcata 240

cttaagcgtc tatggctggt ctagaaaccc actgattgaa tattacattg tcgaaaattt 300

cggtacctac aatccgagta ccggcgccac aaaattaggc gaagtcacta gtgatggatc 360

cgtatatgat atctaccgta cccaacgcgt taatcagcca tcgatcattg gaaccgccac 420

cttttatcag tactggagtg ttagacgtaa tcatcggagc tccggttcgg ttaatactgc 480

gaatcacttt aatgcatggg cacagcaagg gttaacccta ggtacaatgg attatcaaat 540

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<210> 40

<211> 36

<212> DNA

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<220>

<223> Tx-75A-1

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<210> 41

<211> 42

<212> DNA

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<223> Tx-105H-1

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<210> 42

<211> 44

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<223> Tx-C1

<400> 42
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<210> 43

<211> 36

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<223> Tx-del(123-144)-1r

<400> 43
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<210> 44

<211> 42

<212> DNA

<213> Artificial Sequence

<220>

<223> Tx-105R-1

<400> 44
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<210> 45

<211> 41

<212> DNA

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<223> Tx-N1

<400> 45
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<210> 46

<211> 36

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<223> Tx-75-G1

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<210> 47

<211> 66

<212> DNA

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<223> Tx-144R-1r

<400> 47
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actcca 66

<210> 48

<211> 44

<212> DNA

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<223> Tx-161R-1r

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<210> 49

<211> 40

<212> DNA

<213> Artificial Sequence

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<223> Tx-125A 129E-1

<400> 49
ccaacgcgtt aatgcgccat cgatcgaggg aaccgccacc 40

<210> 50

<211> 26

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<223> Tx-116G-1

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<211> 36

<212> DNA

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<220>

<223> Tx-118C-1

<400> 51
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<210> 52

<211> 39

<212> DNA

<213> Artificial Sequence

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<223> Tx-10H11D-1

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<210> 53

<211> 36

<212> DNA

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<220>

<223> Tx-116G118C-1

<400> 53
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<210> 54

<211> 184

<212> PRT

<213> Aspergillus kawachii

<400> 54

Ser Ala Gly Ile Asn Tyr Val Gln Asn Tyr Asn Gly Asn Leu Ala Asp
1 5 10 15

Phe Thr Tyr Asp Glu Ser Ala Gly Thr Phe Ser Met Tyr Trp Glu Asp
20 25 30

Gly Val Ser Ser Asp Phe Val Val Gly Leu Gly Trp Thr Thr Gly Ser
35 40 45

Ser Asn Ala Ile Ser Tyr Ser Ala Glu Tyr Ser Ala Ser Gly Ser Ser
50 55 60

Ser Tyr Leu Ala Val Tyr Gly Trp Val Asn Tyr Pro Gln Ala Glu Tyr
65 70 75 80

Tyr Ile Val Glu Asp Tyr Gly Asp Tyr Asn Pro Cys Ser Ser Ala Thr
85 90 95

Ser Leu Gly Thr Val Tyr Ser Asp Gly Ser Thr Tyr Gln Val Cys Thr
100 105 110

Asp Thr Arg Thr Asn Glu Pro Ser Ile Thr Gly Thr Ser Thr Phe Thr
115 120 125

Gln Tyr Phe Ser Val Arg Glu Ser Thr Arg Thr Ser Gly Thr Val Thr
130 135 140

Val Ala Asn His Phe Asn Phe Trp Ala Gln His Gly Phe Gly Asn Ser
145 150 155 160

Asp Phe Asn Tyr Gln Val Met Ala Val Glu Ala Trp Ser Gly Ala Gly
165 170 175

Ser Ala Ser Val Thr Ile Ser Ser
180

<210> 55

<211> 190

<212> PRT

<213> Artificial Sequence

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<223> TrX-H-11D-ML-75A105H-118C-125A129E-144R161R (TrX-H-11D-ML-AHCAE-RR)

<400> 55

Gln Thr Ile Gln Pro Gly Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser
1 5 10 15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Met Thr Leu Gly Pro Gly
20 25 30

Gly Gln Phe Ser Val Asn Trp Ser Asn Ser Gly Asn Phe Val Gly Gly
35 40 45

Lys Gly Trp Gln Pro Gly Thr Lys Asn Lys Val Ile Asn Phe Ser Gly
50 55 60

Ser Tyr Asn Pro Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Ser
65 70 75 80

Arg Asn Pro Leu Ile Glu Tyr Tyr Ile Val Glu Asn Phe Gly Thr Tyr
85 90 95

Asn Pro Ser Thr Gly Ala Thr Lys His Gly Glu Val Thr Ser Asp Gly
100 105 110

Ser Val Tyr Asp Ile Cys Arg Thr Gln Arg Val Asn Ala Pro Ser Ile
115 120 125

Glu Gly Thr Ala Thr Phe Tyr Gln Tyr Trp Ser Val Arg Arg Asn Arg
130 135 140

Arg Ser Ser Gly Ser Val Asn Thr Ala Asn His Phe Asn Ala Trp Ala
145 150 155 160

Arg Gln Gly Leu Thr Leu Gly Thr Met Asp Tyr Gln Ile Val Ala Val
165 170 175

Glu Gly Tyr Phe Ser Ser Gly Ser Ala Ser Ile Thr Val Ser
180 185 190

<210> 56

<211> 112

<212> DNA

<213> Artificial Sequence

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<223> TrX-HML

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cttttacagc tattggaacg atggccatgg aggcgtcaca atgactctgg gg 112

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<213> Artificial Sequence

<220>

<223> TrX-HML

<400> 57

Gln Thr Ile Gln Pro Gly Thr Gly Tyr His Asn Gly Tyr Phe Tyr Ser
1 5 10 15

Tyr Trp Asn Asp Gly His Gly Gly Val Thr Met Thr Leu Gly
20 25 30

<210> 58

<211> 14

<212> PRT

<213> Artificial Sequence

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<223> TX-105R-1

<400> 58

Thr Gly Ala Thr Lys Arg Gly Glu Val Thr Ser Asp Gly Ser
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<210> 59

<211> 8

<212> PRT

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<223> TX-C1

<400> 59

Gly Ser Ala Ser Ile Thr Val Ser
1 5

<210> 60

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> TX-75A-1

<400> 60

Asn Gly Asn Ser Tyr Leu Ala Val Tyr Gly Trp Ser Arg
1 5 10

<210> 61

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> TX-75G-1

<400> 61

Asn Gly Asn Ser Tyr Leu Gly Val Tyr Gly Trp Ser Arg
1 5 10

<210> 62

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> TX125A129E-1

<400> 62

Gln Arg Val Asn Ala Pro Ser Ile Glu Gly Thr Ala Thr
1 5 10

<210> 63

<211> 14

<212> PRT

<213> Artificial Sequence

<220>

<223> TX-105H-1

<400> 63

Thr Gly Ala Thr Lys His Gly Glu Val Thr Ser Asp Gly Ser
1 5 10

<210> 64

<211> 12

<212> PRT

<213> Artificial Sequence

<220>

<223> TX-del (123-144)-1r

<400> 64

Gly Ser Ser Arg Arg Gln Thr Arg Tyr Ile Asp Tyr
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<210> 65

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> TX-N1

<400> 65

Gln Thr Ile Gln Pro Gly Thr
1 5

<210> 66

<211> 22

<212> PRT

<213> Artificial Sequence

<220>

<223> TX-144R-1r

<400> 66

Trp Ala Asn Phe His Asn Ala Thr Asn Val Ser Gly Ser Ser Arg Arg
1 5 10 15

Asn Arg Arg Val Ser Trp
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<210> 67

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> TX-161R-1r

<400> 67

Thr Gly Leu Thr Leu Gly Gln Arg Ala Trp Ala Asn Phe His Asn
1 5 10 15

<210> 68

<211> 9

<212> PRT

<213> Artificial Sequence

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<223> TX-116G-1

<400> 68

Asp Gly Ser Val Tyr Gly Ile Tyr Arg
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<210> 69

<211> 12

<212> PRT

<213> Artificial Sequence

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<223> TX-118C-1

<400> 69

Asp Gly Ser Val Tyr Asp Ile Cys Arg Thr Gln Arg
1 5 10

<210> 70

<211> 13

<212> PRT

<213> Artificial Sequence

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<223> TX-10H11D-1

<400> 70

Gly Thr Gly Tyr His Asp Gly Tyr Phe Tyr Ser Tyr Trp
1 5 10

<210> 71

<211> 12

<212> PRT

<213> Artificial Sequence

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<223> TX-116G118C-1

<400> 71

Asp Gly Ser Val Tyr Gly Ile Cys Arg Thr Gln Arg
1 5 10